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ABSTRACT

This study investigated how different types of computer-mediated communication (CMC) such as asynchronous forums, synchronous forums and e-mail were used to support an alternative approach to initial teacher education that relied on the formation of a knowledge-building community (KBC). The KBC involves students working in small and large groups to solve "real world" problems, and in the process develop skills of negotiation, communication, and collaboration. Emphasis is placed on authentic problems that are linked to a school context. The findings showed that the students preferred to use forums available to all participants. Also they used the forums in a variety of ways, in addition to those intended by the authors. Further, many students made use of other modes of CMC such as e-mail and synchronous forums downloaded from the Web. Findings also indicated that many of the skills used in mediating face-to-face discussion could be transferred to the on-line situation. (Contains 30 references.) (Author/RS)

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USE OF COMPUTER-MEDIATED COMMUNICATION TO FORM A KNOWLEDGE-BUILDING COMMUNITY IN INITIAL TEACHER EDUCATION

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USE OF COMPUTER-MEDIATED COMMUNICATION TO FORM A KNOWLEDGE-BUILDING COMMUNITY IN INITIAL TEACHER EDUCATION

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Abstract

This study investigated how different types of computer-mediated communication (CMC) such as asynchronous forums, synchronous forums and e-mail were used to support an alternative approach to initial teacher education that relied on the formation of a knowledge-building community (KBC). The KBC involves students working in small and large groups to solve 'real world' problems, and in the process develop skills of negotiation, communication, and collaboration. Emphasis is placed on authentic problems that are linked to a school context.

The findings showed that the students preferred to use forums available to all participants. Also they used the forums in a variety of ways, in addition to those intended by the authors. Further, many students made use of other modes of CMC such as e-mail and synchronous forums downloaded from the Web. We also found that many of the skills we used in mediating face-to-face discussion could be transferred to the on-line situation.

Key words: computer-mediated communication, knowledge-building community, teacher education

1. INTRODUCTION

For more than a thousand years universities operated on the assumption that information would be stored centrally and scholars would come to this central store of knowledge and collaborate to produce more information that would be stored at this site. Modern, digital information storage and the use of telecommunications allow scholars to access information from any location that connects to the Internet. Thus, instead of people coming to the information, now the information comes to them.

When information comes to people there are many benefits such as: direct access to a broader range of information; access to learning environments outside normal lecture and tutorial times; greater opportunity for experiencing a variety of instructional strategies including small group discussion and collaborative projects; and exposure to a forum for expressing and sharing ideas (Lockyer, Patterson & Harper, 1999). Even though the technology allows greater access to stored knowledge and distributed personal knowledge, some researchers claim that education that is entirely based on such technology contributes to a loss of community. For example, Besser and Bonn (1996) assert that it is difficult to build collaborative relationships among students, but Romiszowski and Mason (1996) showed that technology allows for genuine conveyance of human communication and learners can develop relationships regardless of the reduced cues associated with computer mediated communications. Reeves and Reeves (1997) add to the debate and state that "despite all the interest, little research evidence exists to support claims for the effectiveness of Web-based instruction" (p.59).

This study contributes to this debate by providing learner-centred research evidence regarding the effectiveness CMC to foster the development of preservice teacher understanding of the values, norms, and habitual ways of seeing which belong to the teaching profession. This learning process relies on the effective integration of learners into a community of practice (i.e. the teaching community) and is facilitated through immersion in the discourse of the teaching community (Schon, 1983; Vygotsky, 1978). Such learning processes are "grounded in talk" and can stimulate higher order thinking skills by providing a context and mechanism for explanation, justification and reason (Duffy & Cunningham, 1996, p.181; Oliver, Omari & Herrington, 1997). Therefore, learner interaction with instructors, teachers and other learners is essential if preservice teachers are to master the concepts and skills associated with their profession. Price and Petre (1997) assert that this approach gives the learner a perspective and places them within a learning community that is grounded in professional practice.

This study focused on the development of a learning community that was based upon discourse and learner interaction. Both face-to face and on-line communities supported our approach to initial education that we called a 'knowledge-building community' (KBC).

2. A KNOWLEDGE-BUILDING COMMUNITY (KBC) IN TEACHER EDUCATION

The purpose of the KBC project was to provide students enrolled in an initial teacher education course with an alternative pathway to professional socialisation through the formation of a Knowledge-Building Community (KBC). Such professional socialisation occurs through the transmission of values, norms, and habitual ways of seeing which belong to particular occupations and shape the way that people conduct their work and establish themselves in the larger social world (Schon, 1983; Bowen & Marton, 1998). There are many educators who claim that distance education technologies cannot support

such a process (Weedman, 1998), but we argue that distance education technologies *can support* this process *provided* it occurs within a clearly defined knowledge-building community.

A 'knowledge-building community' (KBC) is described by Berieter and Scardamalia (1993) as a group of people who investigate problems. Members of a KBC work as groups and not as individuals and are engaged in progressive discourse in an iterative process of knowledge building.

The Faculty of Education at the University of Wollongong wanted make use of problem-based learning to stimulate enquiry at a school-site and to use collaborative technologies to support the formation of a KBC. The KBC model we adopted consisted of three interacting sources of learning:

1. Community-learning (CL) which involved students, university and school facilitators sharing knowledge as a community;
2. School-based learning (SL) which involved the students in authentic school contexts;
3. Problem-based learning (PBL) which involved students working in groups to investigate problems.

2.1 Using Computer Mediated Communication to support a KBC

The collaborative technologies used were designed to provide students with communication tools that they could use to engage in informal processes of knowledge sharing and construction. The current study is significant because it contributes to the understanding of how the students used the available CMC to support problem-based learning and their understanding of the teaching profession. Also, it investigated whether students were prepared to experiment with other forms of CMC if it better suited their purposes. Further, it adds to the understanding of the role that the facilitator plays in mediating on-line discussion.

Weedman (1998) reported that in early studies about students use CMC students desired more face-to-face interaction, but Holland (1996) reported that students consider the process of collaborating on group projects to "much the same" as face-to-face. Several of the early studies were criticized because they emphasized course development or learner outcomes rather than process outcomes (Holmberg, 1987; Collis,1993).

We believe that CMC supplements face-to-face teaching by providing discussion forums that are non-threatening. CMC tools also allow individuals to maintain links with their community of practice and to take advantage of the scaffolding that is provided by a dynamic social context. Such links allow for legitimate peripheral participation (Lave & Wegner, 1991).

2.2 The Role of Problem-based Learning in the KBC

Problem-based learning (PBL) is a curriculum development and an instructional strategy designed to challenge students (Finkle &Torp, 1995, Novak, 1996). Originally developed for medical schools, it was seen to be 'tailor made' for medicine because it provided advantages for both acquisition of knowledge and development of problem solving skills in patient care (Barrows & Tambly, 1980). A curriculum that makes use of PBL encourages and motivates students to 'learn to learn' (Duch, 1995). Above all, PBL challenges students to take charge of their education (White, 1996) by involving students in small groups to solve 'real world' problems (Duch, 1995). During this process, students develop skills in negotiating, communicating, and collaborating (Aldred et al., 1997). The emphasis is placed on 'real world' problems that are 'ill-structured' (Gallagher, Stepien & Rosenthal 1992). Ill-structured problems have the following characteristics:(1) they require more information to understand the problem, (2) the problem definition changes as new information is added to the situation, (3) many perspectives can be used to interpret information, and (4) there is no absolutely 'right' answer (Barrows,1990).

The Faculty of Education at the University of Wollongong wanted to use a PBL approach to respond to recurrent themes emerging from studies that sought to follow-up graduates of teacher education courses. One was that many students reported that they left university with feelings of being under-prepared for life in classrooms and confused by what confronted them when they arrived at schools (Armour & Booth, 1999; Ramsey, 2000). The other was that schools which employed them reported that a majority of recent graduates were unaware of how school and classroom cultures operated (MACQT, 1998; Ramsey 2000).

Hoban (1999) asserts that this situation arises because teacher education courses present a fragmented view of learning and he claims that there are three reasons for this:

1. teacher education courses often split the study of learning into independent subjects focussing on psychological and sociological aspects and this can lead to a narrow and fragmented view of learning;

2. the organisation of these subjects is often based on the delivery of decontextualised, theoretical knowledge that has little relevance to trainee teachers;

3. practice teaching occurs in isolation from the university context.

The literature about socialisation to the professions supports Hoban's view. Weedman (1998) contends that "professional socialisation is a complex and variable form of learning, highly collaborative in nature."(p.1) It involves the transmission of social constructs, language, belief systems and symbolic lives that are unique to the profession (Schon, 1983). Brown and Duguid (1993) argue that this type of learning makes use of knowledge that must be "stolen". They contend that the most important knowledge is that

which cannot be taught and students must find ways to steal it from their educational environment.

Our approach to the KBC course was influenced by normal financial constraints and it is not resource intensive. For example one constraint was that we only had sufficient resources to offer the KBC course every alternate semester. Thus the KBC course was not offered students followed the 'mainstream' university course.

The first semester of our KBC course had two parts. The first part ran for five weeks and was designed to prepare students to work in a learning community. Fifty hours of course work was devoted to provide learning experiences that encouraged students to learn to work together effectively in small and large groups. They also developed teamwork skills as they acquired problem-solving skills.

Another goal of the first part of the course was to prepare students to be what was called a 'teaching associate'. A 'teaching associate' supports a classroom teacher's work and may help teachers to; prepare and teach lessons, mark written work, read to children, have children read to them, run excursions, conduct sports training, supervise the school yard as well as a host of other functions that emerged as we gained experience with the program.

The second part of the KBC course ran for nine weeks. During this time students attended their host school for two days per week and attended university for one or two days per week. When they were in schools they had two main roles. One was to be an effective teaching associate and the other was to be what we called 'an educational anthropologist'.

The role of an educational anthropologist was to 'live' within the school community and to 'steal knowledge' (Brown & Duguid, 1993) that would help them to develop an understanding of the culture of their schools and of the actions of the children and teachers that they observed. Thus they needed to work with a number of teachers and allied professionals who acted as 'informants' about their profession and the culture of the school. As they gathered this information they would share it with others in their community.

3. PURPOSE OF STUDY

The purposes of the study were:

1. To understand how members of the knowledge-building community made use of CMC to developed their understanding of the professional role of primary school teachers;
2. To describe the role that the lecturers took in mediating on-line discussion among members of the knowledge-building community.

The following research questions were posed:

1. How were the available forms of CMC used to develop an understanding of the professional role of primary teachers?
2. What were some of the limitations associated with the use of these communication technologies?
3. Did the members of the KBC use any other forms of CMC?
4. What role did the lecturers play in mediating the on-line discussions?

4. THE PARTICIPANTS

This initial study conducted in (1999) was limited to a group of 22 year one primary education students who were enrolled in the first session of a KBC course in initial teacher education. The age of the students ranged from 18 years to 45 years and gender composition was three males and 19 females. Since then another 2 cohorts have been enrolled and the findings from these groups will be reported at another forum.

All participants in the initial cohort were taught to use an asynchronous discussion space (DISCUS) during the 2nd week of the session. During the next week they had two additional one-hour training sessions that focused on the use of a private, small-group discussion space and an open forum (public discussion space). DISCUS could be accessed from their home computer, a group of 5 computers available in their university home room or from any of the computers within the university computing laboratories.

5. METHODS

The purpose of the first part of the study was to understand how members of the KBC made use of CMC to develop an understanding of the professional role of teachers in primary schools. Data were gathered from two sources: student interviews held half-way through the session and at the end of the session; and text downloaded from the various communication technologies used.

Students gave us permission to download their messages and were aware that others would be able to read their messages. Only one student was concerned about this issue so we encouraged her to lurk in the background and only to contribute when she felt comfortable. This happened by the third week of session.

The original criteria for classifying interview transcripts and downloaded text were based upon the three elements of the KBC community: community learning; school-based learning and problem-based learning.

Data pertaining to the lecturers' role in mediating on-line discussion came from post-session interviews with lecturers and analysis of text that students contributed to the discussion spaces. Names of students have been changed for the purposes of reporting findings.

6. RESULTS AND DISCUSSION

The results are organised under the following headings: community learning; school-based learning and problem-based learning. Under each heading the contribution of each mode of CMC is discussed. Finally, the ways in which the CMC were used and the roles the lecturers played in facilitating on-line discussion are described.

6.1 Community learning

The KBC project was designed so that community learning (CL) would support the students as they embarked upon the other two sources of learning (PBL & SBL). Thus, the establishment of a community atmosphere was initiated from the first day of session. Team building workshops and activities were designed to engage students in learning experiences that allowed members to learn to work effectively with all members of their cohort.

In order to enhance the community learning atmosphere the students were housed in a special 'home room'. This room was the physical space in which the students and the four lecturers who facilitated their learning met for all the activities that were at the core of PBL.

The asynchronous forum (DISCUS) was used to support community discussion. This allowed for individual discussion, intergroup, and intragroup discussion as well as lecturer input. As mentioned previously students could access the forum either from the homeroom, campus computer laboratories or from their home computers. The first quote comes from an interview held early in the course.

> *This community atmosphere is just so beneficial to learning because so many people I knew from Sydney University last year spent the first few months by themselves, in lectures, and at lunch. How can you learn when you are upset and lonely? At the end of the first week of the KBC project I knew some people. I never felt lonely.* Susan 29.3.99

Early in the end of the preparation phase the students learnt to use the asynchronous discussion space (DISCUS) and e-mail and Kime and Karen echoed Susan's earlier comments via the discussion space.

It's been great. I have loved working in groups. I have had the best time. I have found that by working in a friendly environment you learn more. Kime 31.3.99

I don't think I am learning and then I go home and all this stuff comes out. I think where did that come from? We talk. If we have a problem we talk... We had so much fun with our group poster we weren't afraid to say anything. One of my initial concerns about this course was that my friends weren't doing it and I thought that I would be on my own but just the opposite has happened and I have made so many friends. Karen 1.4.99

Several themes emerged from student contributions to the discussion space. First, it appeared that friendship and community support assisted their learning because they felt comfortable in their environment and learnt through participation in face-to-face as well as via electronic conversation, and KBC class activities. Second, they were making use of the communication technology to clearly express opinions. In interviews they said that they had time to think and compose a response rather than quickly react as they often did in face-to-face interactions.

Third, students preferred the community discussion space as opposed to the restricted discussion space because everybody could contribute and follow all of the threads of the conversations. After 6 weeks we removed access to the restricted discussion space because students told us they were not using it.

6.2 School-based learning

This source of learning provided students with an opportunity to better understand the culture of schools, teaching and classrooms. It was intended that students could achieve this through observing and interviewing teachers, providing support for teachers, and teaching individual and small groups of students. A mentor teacher who was released from class duties for one day per week coordinated these experiences.

After three weeks of in-school experience the students involved in the KBC project were beginning to understand that teaching was a much more multifaceted and complex role than they first thought. Lisa discussed her views on the forum and said:

I had no idea of the preparation, organisation and behind the scenes work that teachers had to do. I have had a respect for the work teachers do during the day, in school hours, but even in this I wasn't aware of the full extent of it; as I am still not now, but do feel more aware than previously... Lisa 5.5.99

Susan became the most prolific user of the communication technology and made regular contributions to the asychronous forum and via e-mail to various trusted informants. Below is a copy of one of her later evening e-mails to one of our researchers.

Teachers talk so much in the staffroom about different topics; it really is a collegial atmosphere. It's usually focused on different activities that are happening during the day and how they're going to coordinate them all. They all help each other out with the stuff that's going on. I was never aware of the intense preparation months before hand. My mentor was describing what they do to prepare for their program - all the infants' teachers get together before term starts and work out what they are going to do EACH day for the rest of the term! Each day, so far ahead! I kind of thought you worked it out the night before! Susan 12.5.99

The above quotes from KBC students indicate an increased awareness of teachers' work. Also they were expressing similar views via different modes of CMC. It would appear that in a very short space of time the students were beginning to appreciate and witness the complex and multi-faceted roles of a teacher. Also, they could use a variety of modes of communication to express these ideas.

Students were also becoming aware that teaching requires high-level skills and practice is need to develop these skills. Importantly, students were gaining insights that teaching is a life-long commitment and it requires life-long learning.

6.3 Problem-based learning

The third learning source helped students to extend their understanding of the professional role of teachers but first they needed to develop the skills of PBL and the preparation phase, where they worked in small self-directed groups in order to solve open-ended problems was designed to meet this purpose. Thus the preparation phase helped students to understand that PBL requires a great deal of honest and open communication. However, as Lave and Wenger (1991) assert the community does not necessarily have to be warm and effusive; instead it can be diffuse, fragmented and contentious. This was the case with several groups involved in this study and the following e-mail from Julia illustrates this point.

Initially I thought that we were unable to communicate effectively, as some people dominated the discussions while other people had good ideas that were not listened to... 14.5.99

e admit that our inexperience in developing suitable problems for students to solve whilst in schools contributed to some confusion and general intellectual unrest. The first problem we developed focused on investigating approaches to the teaching of literacy skills to children (5 to 9 year olds). The problem 'package' consisted of: a description of the scenario, information about how to access to a video tape of the original debate, a set of readings and a set of primary school English syllabuses, and a detailed statement of suggested learning outcomes.

In retrospect we now acknowledge that we suggested too many detailed learning outcomes and this contributed to the silence that befell the room when we issued the first problem package. Certainly, it was an indication that we needed to rethink our approach when we prepared our second problem which focused on the development of multiple intelligences in young children (Gardner, 1987). Again we provided some readings, and access to other resources. However, the number of suggested outcomes was reduced and they were more general.

Students who were reticent to voice their real opinions about the first problem in class were far more forthright in voicing their concerns through the asynchronous discussion forum and via e-mail. They were prepared to say that the problem was too big and lasted for too long as they felt that it overshadowed and dominated their life! (our feelings were the same by the end of the first problem!). For example, Susan a competent student who produced a high quality assessment task for problem one, felt tired and drained.

> *I'm slowly dying. I am just so tired that I cannot think anymore. I am a zombie. This whole literacy thing is just so enormous. I hate assignments and I am so sick of this problem. Susan 14.5.99*

The combination of several new factors for the students (i.e the role of a teacher associate combined with the problem assessment task) prompted us to modify the problem so that we covered less material but to a greater depth and Julia's final e-mail about the second problem illustrates this point.

> *We were able to accomplish the second problem better as we had more knowledge of how to go about it, it wasn't as big as the first one. Julia 28.6.99*

7. THE ROLE OF COMPUTER MEDIATED COMMUNICATION

During the first three weeks, students were making two to three entries on the discussion space each week. Of these, 13 used on-campus computers and the remainder used their home computers. The most prolific users of the discussion forum were those who had home computers and five owners of home computers were contributing up to 5 times per week. We allowed students continuous access to the forum during session breaks and into the next year. The rate of use remained much the same even though the students were no longer working as an 'official' knowledge-building community. Topics discussed still related to school and teaching. For example a more recent thread was called "a maths problem" and focused on the teaching of problem solving skills during mathematics lessons. By the end of the year most students had their own computer and this allowed them to make entries from home and it came as no surprise that the number of entries per student increased.

Students also made use of group and individual e-mails, but the asynchronous discussion space was the main means of electronic communication. It contained a total of 572 entries by the end of the first teaching session (13 weeks). During the session entries were printed and read by a research assistant who classified them into temporary categories. These categories were discussed with the research team who looked at the examples provided by the research assistant and made further suggestions. The process was repeated two more times and by the end of our final meeting all members of the team agreed with the categories. As a result the entries were classified as problem-related, school-related, group-related or personal. A large number school-related entries (95) were about how the students or their mentor teachers managed their classes. This finding appears to support the research reporting that beginning teachers are very concerned about classroom management during their initial teaching experiences (MACQT, 1998; Ramsey, 2000).

One group that was widely separated in terms of distance decided to use a synchronous discussion space that they downloaded from web (ICQ). The following quote shows the general tone of their conversation on this forum was about organising group tasks and group meetings.

> *Being a leader isn't that involved it just means keeping people on task....We'll see what we can get done on Thursday, I feel we need to focus and brainstorm etc and we need a peaceful place to do that. Fiona 4.5.99*

The forum entries were read again and a procedure similar to the one previously described was used to see if we could make any generalisations about how the forum was used. At this stage we feel that the generalisations that follow can be made about the how students and the lecturers used the forum. However, caution is needed as the ways that student and lecturer currently use the forum represents a particular stage in our use of the technology and we acknowledge that this may change, as students and lecturers become more familiar with the PBL process and the technology.

The generalisations that we felt that we could make were:

1. The tone is one of communication about the problem, the school, the groups or assessment;
2. Controversial comments were delivered anonymously. For example one entry on the discus space said:

> *It is really a shame to see many people being all secretive and competitive. Please make an effort to try to limit the competition. We are all filling the vessel of information together..Anonymous 7.5.99*

One member of the lecturing team was 'lurking' in the background and he took the opportunity to mediate the discussion. His entry follows:

> *...I think that it is healthy that we have a vehicle (discus) to express our comments publicly be anonymous or not. It is good that there are different perspectives on what we are doing and it is important that we stay open minded to hear these perspectives. Hoban 11.5.99*

3. Without direction little deep knowledge-building happens through these modes of communication. In the context of this study three of the authors (Ferry, Kiggins and Hoban) were involved in PBL, SBL and CL. We were involved in the design of the problems, the facilitation of groups, monitoring of school-based learning and in contributing to the face-to-face and the on-line learning community.

   We soon learnt that monitoring wasn't enough and that we had to contribute regularly, otherwise the discussion would go off at 'tangent' and deal with peripheral rather than core issues. Further, we feel that the strategies we used (e.g. encouraging contributions through positive reinforcement, allowing the debate to run until the discussion was peripheral, re-directing discussion, summarising points of view) mirrored those that we would normally employ in a face-to-face situation;

   4. Initially, access to the technology at home restricted students as at least one person from each school group was not connected to the Internet at the start of the session. At the end of the year all had a home connection to the Internet;

   5. CMC was a support and a catalyst for other modes of communication such as small group face-to-face meetings (formal and informal), large face-to-face groups (formal meetings at university) and numerous telephone conversations (informal).

9. CONCLUSION

This study has been a new learning experience for students and lecturers and we admit that we still have a great deal to learn about the role of PBL in the KBC and the use of computer-mediated communication. We feel that the KBC concept supported by computer-mediated communication has contributed to the professional socialisation of students by addressing four issues. First, it has helped students to define the profession in which they will work and to realise that they are responsible for the development of the knowledge and skills needed to become a member of the teaching profession. Second, they have developed an understanding of the professional life of teachers and the nature of teachers' work. Third, they have come to realise that there is a body of knowledge that they need to access in order to be educated about the profession, and finally they have developed a sense of professional identity.

The combination of learning from three interacting sources of information of a Knowledge-Building Community (KBC): community learning; school-based learning and problem-based learning have enhanced the process of professional socialisation. Also the evidence from the forum, written assignments, interviews and school visits suggests that the KBC process helped students to develop an understanding of the following: norms of service, specialised 'teacher' knowledge, teacher autonomy in exercising professional judgment, teacher autonomy in setting educational requirements and standards of service, and the existence of a code of ethics of the profession. They have also learnt about the professional life of teachers - the language of the profession, belief systems, symbolic lives. Also by performing a professional role in schools they have developed some sense of professional identity.

We also learnt that when students use computer-mediated communication in a KBC they can be very creative and forthright in sharing opinions and ideas. However, like face-to-face conversation, they can deviate from intended pathways and lecturers need to continually monitor the discussion and provide input at appropriate moments – just establishing the community forum is not enough.

We also found that the asynchronous discussion space (DISCUS) was the most popular forum but the other modes of CMC such as personal e-mail gained popularity as friendships developed. In 2000 and in 2001 the KBC group(s) reformed and the authors used the findings from this study to inform the design of a modified CMC support structure that used WebCT. The findings from the 2000 and 2001 experiences will be reported in a subsequent paper, but the overall trends were much the same as reported in this paper.

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